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owing to circumstances mentioned in section IV., is too often uppermost in his mind. A student of this category had much better go abroad for his degree than to a second-rate American institution. Of course some care must be exercised by him in the choice of his university, or he must have good fortune in writing a thesis whose weak points are not evident on a superficial examination, but his task is, on the whole, not a difficult one, and he gets at least the advantage of a period of foreign residence.

For another class of men foreign study may be recommended without qualification, namely, for able students who have already had a substantial training in one of the better American graduate schools, or who have even taken the doctor's degree at such a school. Such men will naturally go either to one of the great mathematical centers like Paris or Göttingen, where they will have the opportunity to hear lectures by several of the leading mathematicians of the day, and, perhaps, to see some of them occasionally outside of the lecture room; or they will select some mathematician of eminence in a particular field with whom they may hope to gain direct personal contact, and go to the university where he happens to be. Thus of late years a small but steady stream of American students has gone to Italy.

To the students just considered, and to some extent to their weaker comrades mentioned above, the period of residence at a great European mathematical center or of contact with an eminent mathematician at a less important European institution brings with it a realization of what high scientific ideals in mathematics are, and to what an extent they prevail abroad. Such ideals prevail also, it is true, at the strongest American institutions; but it is hard for the young American to appreciate their

great diffusion in a ripened civilization until he has experienced it by personal contact.

*ADDRESS AT THE UNVEILING OF THE
BUST OF WOLCOTT GIBBS IN RUM-
FORD HALL, CHEMISTS' CLUB,
NOVEMBER 25, 1911*

BECAUSE of the place of his birth and that where he was educated; because of the profession he chose and which he so highly adorned; because during the greater part of his mature life he applied his splendid talents and broad attainments to the realization of the hopes of the founder of the Royal Institution in his bequests to Harvard College and to the American Academy of Arts and Sciences; and because he was an academician and a club man, it is eminently fitting that the bust of Wolcott Gibbs should be unveiled in the Rumford Hall of the Chemists' Club of the City of New York.

For on February 21, 1822, he was born in this city of New York; in 1841 he received his baccalaureate degree from Columbia College of this city; in 1845 he received the degree of M.D. from the College of Physicians and Surgeons of this city; he chose chemistry as his profession; he was Rumford Professor of Harvard College and Harvard University for forty-five years and a member of the Rumford Committee of the American Academy of Arts and Sciences for thirty years; he was founder, member and president of the National Academy of Sciences; he suggested and organized the Union League Club of New York and he promoted and supported other social organizations.

His education was, however, much broader and more comprehensive than that comprised in his satisfaction of the requirements for the degrees awarded him at Columbia College and the College of Physicians and Surgeons, for in the interim between his graduation from the first named institution and his entrance on the second he served as laboratory assistant to Dr. Robert Hare, professor of chemistry in the University of Pennsylvania, then the most

eminent chemist America had produced and to-day revered for his splendid contributions to science. On his graduation from the College of Physicians and Surgeons, Gibbs went to Europe, where, until 1848, he continued his studies under the direction of the eminent chemists, Rammelsberg, Heinrich Rose, Liebig, Laurent, Dumas and Regnault, whose names are each inscribed upon the honor roll of those to whom the chemistry of to-day owes its place among the sciences.

Broadened by travel, by contact with these eminent investigators, and the students that gathered about them, Gibbs returned to his native country for service in his profession, and found his first opportunity in the delivery of a short course of lectures in a minor institution in Delaware, but very shortly after, in 1849, he was appointed professor of chemistry in the Free Academy, now the College of the City of New York, where he remained until 1863, when he accepted the Rumford professorship, requiring service in chemistry, in the scientific school of Harvard College.

His term of service in New York was distinguished, for, while his duty to the college demanded only that he teach its students the elements of chemistry, he began in 1851 as associate editor of the *American Journal of Science*, the preparation of abstracts of foreign literature in chemistry, and he engaged in research, with the result that in 1857 there was given to the world the first memoir on a notable and systematic research in chemistry from America, when the Smithsonian Institution published the memoir of Gibbs and Genth on "The Ammonio-Cobalt Bases," which has ever since served as a model for the presentation of results by investigators in chemistry. In 1861 his independent paper on the platinum metals appeared and, as Clarke says, "firmly established his reputation."

Gibbs was in New York when our Civil War came on and, devoted as he was to his profession, he was also a patriot. It will be recalled that in broadly fitting himself for his profession he had at the College of Physicians and Surgeons pursued that branch of Applied

Chemistry styled medicine and qualified in it, hence he could serve his country best and most by the exercise of his special knowledge and attainments. When men are rushing to expose themselves as targets for the enemy it requires a high degree of courage to offer on the altar of one's country one's special talents in service outside the firing line. But this Gibbs did and the U. S. Sanitary Commission stands to-day as an epoch in the civilization of man. By its work it proved, perhaps, to be the greatest good for mankind that was realized from that dreadful period of labor in which a great nation was born. It has been a model for other nations that have subsequently, unfortunately, been engaged in war.

Not content with applying his acquired knowledge, especially in that branch of applied chemistry known as medicine, to the amelioration of the "horrors of war" and to the aid of those that conquered, Gibbs sought to organize and crystallize opinion and effort by bringing together those of influence in New York who favored active military operations against the seceders and thus the Union League Club, which met, to organize, in his home, was formed. And throughout his life he was an organizer, or member, of bodies of men through which, by investigation, consideration and discussion, issues of moment in science were carefully wrought out, while social relations were conserved and promoted.

He was born and reared under conditions that could have bred an aristocrat. His father was in affluent circumstances. His progenitors had served their country and mankind in positions of importance. He inherited a competency. His associations from earliest youth were with the cultivated, intellectual and forceful. He was in person impressive and engaging. He was in taste and dress discriminating; but he was in his dealings with and estimates of man democratic.

As a prospective student I met him in 1868 and he looked to me god-like. It was my good fortune not only to be received as a student by him, but later to become his assistant and, through other fortunate circumstances,

such as being ordered to duty in Newport, where he resided after his retirement, to keep in contact with him quite up to the time of his death. I recall most vividly my first meeting with him, for he embodied in the flesh all that I had ever imagined of man, and though my relations with him were afterward quite close this feeling and belief persisted and remains. He was above the average man in height, and his body was symmetrically developed with his stature so that he walked and moved with natural gracefulness. His head was admirably proportioned and was covered with a splendid mass of curling black hair which matched the beard that covered his face. In clothing and person he was always decently fastidious, but ever the attracting features were his eyes, which were deep brown in color, lustrous and luminous; and his voice, which was full and rich, with a deliciously attractive and convincing overtone.

He gave the impression of mildness and fairness and continued association confirmed this first impression. Never have I met one who so avoided definitely judging his fellow-man or who when forced to do so judged him more fairly and without prejudice, for his mind was filled with the contemplation of nature in a large way and of its processes, and he was endeavoring constantly to comprehend them and to record the results of his observations and tests for the benefit and use of mankind. He regarded his fellow man in the same broad and tolerant manner. In fact the definite impression of him which one received by close contact with him was largeness of vision; breadth of view; tolerance of differences in opinions, methods or manners; and sympathy, in a broad way, for mankind; and that he approached every issue, scientific or social, without prejudice, and with an entirely open mind.

If, in my attempt to portray Dr. Wolcott Gibbs from the image that abides with me, I have conveyed to you the impression that, through timidity or indolence he sought to avoid strife, let me hasten to immediately correct this erroneous impression, for on the con-

trary he was intensely human and he met his troubles in a thoroughly human way, but even then on a high plane.

Permit me to illustrate by an anecdote or two. Self-government by students is regarded in this country as a very modern and novel development. Dr. Gibbs introduced it at the outset of his coming to Cambridge. I do not know that he had not previously done so in the College of the City of New York. Eventually in my career as a student in his laboratory I succeeded to the first place in the governing body and I wore the resounding title of chief of police. During my administration a rebellion arose. The orders I gave were not obeyed and the fines I assessed were not paid. Having exhausted all the resources of authority at my command and the disorder having become a menace to all earnest students, after due warning, I resorted to the unheard-of expedient of reporting the recalcitrants to Dr. Gibbs. They were much amused when they were directed to report to this mild-mannered, sweet-tempered gentleman. I was not present at the interview. I never knew what occurred at that interview. The students never told me and Dr. Gibbs never referred to it. But what I do know is that when these students returned they said, "Munroe, you may order us to do what you wish; you may assess such fines as you please; but never again direct us to report to Dr. Gibbs," and from that day until I left the laboratory discipline was complete.

Strange as it may seem Dr. Gibbs became, on coming to Harvard, a storm center. President Hill called him because he had a vacant chair in chemistry to fill and he found in Gibbs the most eminent chemist in America. Gibbs accepted the position at Harvard because it seemed to offer the largest opportunity for usefulness in the field for which he was especially equipped. But his appointment thwarted the realization of the ambitions of others; it became a cause of dissension and the arraying of groups of men against each other. The situation had become acute as I entered upon the scene. In the

regular performance of my duties I was unwittingly forced to know of it, though then I knew not the reason for it or the extent of it. I was especially embarrassed to come upon Professors Gibbs and Cooke, when they were engaged in a gentlemanly, but very personal, altercation.

Unknowingly to me, out of this came my opportunity. While holding the position of private assistant to Dr. Gibbs I was appointed assistant in chemistry in the college under Professor Cooke. With the courtesy that prevails among gentlemen all these arrangements were ostensibly in the hands of Dr. Gibbs and it was from him that I received my instructions to make that visit to President Eliot at which I received notification of my appointment to the college. Naturally and most properly I reported to Dr. Gibbs that I had obeyed his instructions, and the results of so doing, and I can never forget his admonition. Knowing my loyalty to him, knowing that inadvertently I had become somewhat acquainted with the distressing situation, he said, "Mr. Munroe I have been deposed and you are appointed to take my place. You know that my relations with Professor Cooke have not been entirely amicable, yet let me say that you can serve me best by serving him with entire devotion." Thus spoke the man in Wolcott Gibbs.

Were there time I should like to describe the laboratory at the Lawrence Scientific School and the manner in which it was directed by Dr. Gibbs. Fortunately this has been well recorded by Professor F. W. Clarke in his memorial lecture before the Chemical Society of Great Britain and by Stephen Paschall Sharples in his description of the Lawrence Scientific School to the Cambridge Historical Society. I may say that were it to be investigated by an agent of the Carnegie Foundation, armed with a pad and pencil, it must have been condemned. I must further say that after completing my fortieth consecutive year of university teaching I should, if put under oath, state that, measured by pedagogical standards, it was unsound.

But I must add that the results produced were splendid and that the students that survived the process went forth finely equipped to pursue their chosen professions. Dr. Gibbs's visits to us were infrequent, but the impression he made in these conferences were such that he was an ever-living presence and a constantly present example. Mendenhall's remark that a student would prefer to be neglected by Rowland to being taught by another embodies the thought I desire to convey concerning the relation of Wolcott Gibbs as a teacher to his students. The pedagogue trains his pupils as the military sergeant drills the cowherd. But the educator educes from his student his best capacities in the line of his endeavor. He brings the within without. He reveals to the student the latter's own capacities. He preserves to the community that precious gift, individuality, but arouses, and enlivens, and controls it so that it may best serve the community in which that individual may be placed. It is impossible to formulate the manner in which this may be accomplished, for the possibilities vary with each student to be taught and with him who teaches, and the teachers who comprehend this are rare, but such was Wolcott Gibbs.

It is said of Gibbs that he was not a "popular lecturer." I may say that this was most unfortunate for the populace. It has been my privilege to listen to a large number of those public speakers who have commended themselves to the public. As a youth I reported at length, for the newspapers, the lectures of Tyndall and Proctor. I served as demonstrator for Professor Cooke in that charming course of lectures at the Lowell Institute which appeared as "The New Chemistry." I sat at the feet of Edward Everett, Henry Ward Beecher, Wendell Phillips and Emerson. I was enthralled by Julia Ward Howe and Mary A. Livermore. Dr. Gibbs gave us but few lectures, but those were enriched by such a wealth of knowledge, graced with such diction, planned in so thoroughly logical and systematic a manner and presented with such

charming simplicity as to ever remain as almost unapproachable models.

For Dr. Gibbs was ever true to his best capacity (his proper sphere of usefulness to his fellows), namely, research, and he continued this long after his retirement from the field of teaching. As one reviews his achievements in research one is amazed at the catholicity of his accomplishments. All recognize his numerous contributions to analytical chemistry, his application of the electric current to quantitative determinations being especially well known; but he covered the field from gravimetric, through volumetric, to gas analysis. It is also pretty generally known that his early investigations of the complex ammonium bases, and their compounds, were in his later life supplemented by researches into the constitutions of the complex inorganic acids. Organic chemistry claimed his attention. In 1853 he prepared an arsenical derivative of valeric acid. In 1868 he discussed the constitution of uric acid and its derivatives. In 1869 he described some products formed by the action of alkali nitrites upon them. In 1891 and 1892, with H. A. Hare and E. T. Reichert, he treated of the physiological action of definitely related chemical compounds. He produced memoirs on a normal map of the solar spectrum and on the wave-lengths of the elementary spectral lines, and, in the study of interference phenomena, he discovered a constant, which he styled the interferential constant. The time allotted me is too brief to enable me to set forth the work of an investigator who at the age of eighteen published a paper entitled a "Description of a New Form of Magneto-electric Machine, and an Account of a Carbon Battery of Considerable Energy" and at seventy-one years of age published a method for the separation of the rare earths, further than to say that while Gibbs was an experimentalist rather than a theorist he published views on theoretical chemistry that have force to-day.

By virtue of his sympathy and breadth he became a pioneer in comprehending, assimilating and expounding the results of others,

giving them always full credit. He was the first American to adopt and promulgate the conclusions of Cannizzario; so early as 1880 he appreciated the value of the researches of J. Willard Gibbs and was the prime factor in having the Rumford medal conferred on this immortal Yale physicist. I well remember his enthusiasm in those early days when speaking of the recently published, and now classic, memoir of Kekulé.

I fear the privilege you have afforded me to speak of my beloved master has tempted me to overstay the time allotted me and yet I feel I have but inadequately set forth the man and his achievements. In closing permit me to quote from the admirable tribute paid him by Theodore W. Richards:

The circumstances of his early academic life brought him in contact with but few students. This is the more to be regretted because of his enthusiastic spirit, his tireless energy, his recognition of everything good, and best of all his warm human friendship which endeared him to all who knew him. Those who were thus fortunate, whether students or colleagues, will always devotedly treasure his memory; and his place as a pioneer in science in America will always be secure.

CHARLES E. MUNROE

SCIENTIFIC NOTES AND NEWS

ALEXANDER C. HUMPHREYS, president of Stevens Institute of Technology, has been elected president of the American Society of Mechanical Engineers.

MR. EMERSON McMILLIN has been elected president of the New York Academy of Sciences. The vice-presidents for the sections are: Professor J. Edmund Woodman, Professor Charles Lane Poor, Dr. Frederic A. Lucas and Professor R. S. Woodworth.

THE colleagues, friends and pupils of Professor Armand Gautier, professor of chemistry at the Medical Faculty of the University of Paris and president of the Academy of Sciences, on November 26, celebrated the fiftieth anniversary of his connection with the university.

MR. W. BATESON, M.D., F.R.S., has been appointed Fullerian professor of physiology at